

State of California
AIR RESOURCES BOARD

Proposed
September 1998

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR
SYSTEMS DESIGNED TO CONVERT OFF-ROAD VEHICLES, ENGINES, AND
EQUIPMENT TO USE ALTERNATIVE FUELS

Adopted: _____

Note: This is a new document proposed by the Air Resources Board

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CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR SYSTEMS DESIGNED TO CONVERT OFF-ROAD VEHICLES AND EQUIPMENT CERTIFIED FOR 1995 AND LATER MODEL ENGINES TO USE ALTERNATIVE FUELS

The authority for these Exhaust Emission Standards and Test Procedures is found in Sections 43013 and 43018 of the California Health and Safety Code.

I. GENERAL REQUIREMENTS

A. Requirements for Installation

In addition to all other standards and requirements imposed, the following requirements shall apply to all alternative fuel conversion systems to be certified for installation on California-certified gasoline or diesel-fueled off-road engines:

- 1) Shall not cause in its operation or function the emission into the ambient air of any noxious or toxic substance that is not emitted in the operation of such vehicle/engine/equipment without such modification, except as specifically permitted by regulation; and,
- 2) Shall not in its operation, function, or malfunction, result in any unsafe condition endangering the vehicle/engine/equipment, its occupants, other persons, or property in close proximity to the vehicle/engine/equipment, in accordance with the safety requirements specified for the original vehicle/engine/equipment; and,
- 3) Alternative fuel conversion systems for gaseous fuels shall be equipped with a lockoff valve, actuated by an electrical or vacuum signal, preventing delivery of fuel to the carburetor or fuel injection system, while the engine is shut down; and,
- 4) Shall not degrade the driveability/performance of a vehicle/engine/equipment equipped with a conversion system in such a way as to encourage consumer tampering. To verify that the driveability/performance of a converted vehicle/ engine/equipment is acceptable, the Executive Officer may require that an independent laboratory evaluate the driveability/performance. The Executive Officer's determination that driveability/performance must be evaluated shall be based on an engineering evaluation by ARB staff of the conversion system described in the application for certification or on reports or observations that conversion systems similar in design to the system for which certification is sought have caused driveability/performance degradation. The cost of this evaluation shall be borne by the applicant; and,
- 5) With the exception of idle speed control, and throttle position control, no

component or calibration of the conversion system that could affect emission performance shall be adjustable by the system installer or the vehicle's/engine's/equipment's user.

B. Evaluation Criteria

1) Basis of Emissions Evaluation

The Executive Officer shall review the applicant's emission test data and the ARB test results, if any, to determine if the conversion system increases emissions. In the absence of certification emission test data, the Executive Officer shall use good engineering judgment and the results of any bench, functional, emission test results from conversion systems, or Compliance Criteria, if applicable, in making the determination regarding the effect of the conversion system on emissions.

2) Performance and Driveability

The Executive Officer shall evaluate the effects of the conversion system on the vehicle's/engine's/equipment's performance or driveability. If the conversion system degrades the driveability or vehicle's/ engine's/equipment's performance such that owners may be encouraged to adjust the engine settings or tamper with required emission control systems to improve driveability or the vehicle's/engine's/equipment's performance, the Executive Officer may find that the conversion system will increase emissions.

C. Dual Conversion Systems

In the case of dual fuel conversion systems, where the vehicle/ engine/equipment may run on gasoline, diesel, or an alternative fuel, removal of originally required control systems will not be permitted.

D. Emission Control Labels

For installations of alternative fuel conversion systems, references under the appropriate category shall apply, in addition to section II(E).

1) Small Off-Road Engines

“Emission Control Labels - 1995 and Later Small Off-Road Engines,” Title 13, CCR, Section 2404, amended _____.

2) Off-Highway Recreational Vehicle and Equipment

“Emission Control Labels - New Off-Highway Recreational Vehicles,” Title 13, CCR, Section 2413, amended _____.

3) Off-Road Diesel Engines and Equipment

i) For 175 hp and greater:

“Emission Control Labels - 1996 and Later Heavy-Duty Off-Road Diesel Cycle Engines,” Title 13, CCR, Section 2424.

ii) For greater than or equal to 50 hp and less than 175 hp:

“Emission Control Information Label”, Code of Federal Regulations, Part 40, Section 89.110-96.

4) Marine Spark Ignition Engines

The ARB is currently developing regulations for gasoline spark-ignition marine engines, including outboard engines and personal watercraft. Outboard engines are defined as integrated engine and drive units externally mounted to the hulls of the watercraft. Personal watercraft engines are defined as watercraft that are not outboards, inboards, or sterndrive engines. This encompasses watercraft typically thought of as personal watercraft; such engines encompass watercraft commonly known as personal watercraft (Jet Skis, Wave Runners, etc.) and jet boats (the newer class of inboard style watercraft using two-stroke jet propulsion).

Staff is currently scheduled to present its marine engine proposal to the Board in December of this year. Until the marine engine regulations are formally adopted, staff proposes to utilize the U.S. EPA’s definitions, standards, and test procedures for gasoline spark-ignition marine engines as set out in 40 Code of Federal Regulations Part 91.

E. Supplemental Emission Control Information Label

1) The conversion system manufacturer shall provide a supplemental Emission Control Information label, which shall be affixed in a permanent manner to each converted vehicle/engine/equipment, in a location adjacent to the original Emission Control Information Label. If the supplemental label cannot be placed adjacent to the original label, it shall be placed in a location where it can be seen by a person viewing the original label.

2) The supplemental label shall show the vehicle/engine/equipment model year; the Executive Order number certifying the conversion system; the conversion system manufacturer's name, address, and telephone number; and, shall state that the converted vehicle/engine/equipment complies with California emission requirements. The label shall also list any original parts that were removed during installation of the conversion system, as well as any changes in tune-up specifications required for the conversion system. In addition, the label shall show the installer's name, address, and telephone number; the date on which the conversion system was installed; and, the mileage (or engine operating hours) or the date at which the conversion system warranty expires. It is not necessary for emission control labels installed with conversion systems to be machine readable. The supplemental label for an alternative fuel converted vehicle/engine/equipment shall clearly state that the vehicle/engine/equipment has been equipped with an alternative fuel conversion system designed to allow it to operate on a fuel other than gasoline or diesel, and shall identify the fuel(s) that the vehicle/engine/equipment is designed to use.

3) Vacuum hose conversion system manufacturer shall provide a schematic diagram which will include a routing diagram for each alternative fuel conversion system sold and for any other conversion system that requires changes to the original vehicle/engine/equipment system. The routing diagram shall be placed in a permanent manner at a visible and accessible location and shall show modifications to the original vehicle/engine/equipment.

F. Owner's Manual

Each conversion system installed shall include an owner's manual containing at least the following information:

- 1) A brief description of the conversion system, including major components, and their theory of operation;
- 2) For alternative fuel conversions, the correct refueling procedure;
- 3) A listing of necessary service and service intervals, as well as tune-up data, which differ from the service requirements specified by the vehicle's/equipment's/engine's original manufacturer;
- 4) The name, address, and phone number of the installer, as well as a list of names, addresses, and phone numbers of the major dealers in California who supply parts for, or service the conversion system; and,
- 5) Warranty information.

G. Manufacturer's Record Keeping Requirement

Manufacturers of conversion systems shall maintain a record of the vehicle/engine/equipment identification numbers of those vehicle/engine/equipment in which their product has been installed. As part of this record, manufacturers shall identify the installation date and the certification number of those systems installed on each vehicle/engine/equipment and shall identify the vehicle's/engine's/equipment's owners at the time of installation, including the owner's current address and phone numbers at the time of installation. The conversion system manufacturer shall supply a copy of all installation information to the Executive Officer upon request.

H. Installer's Record Keeping Requirement

Installers of conversion systems shall maintain a record as specified in paragraph II(G) and shall provide this information to conversion system manufacturers upon request.

II. NON-APPLICABLE REGULATIONS

All requirements in the referenced California exhaust emission standards and test procedures for gasoline or diesel-powered vehicle/ engine/equipment not directly related to exhaust emission test procedures shall not be applicable to these procedures.

III. APPLICATION FOR APPROVAL

A. A request for certification of an alternative fuel conversion system must be submitted by an authorized representative of the conversion system manufacturer intending to offer the conversion system for sale or installation in the State of California.

B. A separate request shall be required for each model year, even though the emission standards for certifying new vehicle(s)/ engine(s)/equipment may be the same for consecutive model years. The request shall include all test data and other information required pursuant to these Procedures, except where other provisions of the Procedures allow carry-over or carry-across of test data from an engine family to the engine family (ies) for which certification is sought. Procedures governing carry-over and carry-across are discussed under section VI(D), "Approval".

C. An application for approval shall include the following:

1) Identification and description of the vehicle/ engine/equipment in each vehicle or equipment category and engine displacement ranges for which approval is requested. The applicable off-road categories are:

- i. Small Off-Road Engines and Equipment
- ii. Off-Road Diesel Engines and Equipment
- iii. Off-Highway Recreational Vehicles and Engines
- iv. Gasoline Spark Ignition Marine Engines

2) A complete description and identification of the conversion system, including carburetor model number (s), carburetor, fuel injectors configuration/calibration codes (s), vaporizer/regulator model number (s), evidence of proper assembly of the fuel tank and fuel lines, and the necessary modification(s) to the engine or vehicle.

3) A statement of recommended maintenance procedures, including initial installation and initial tuning, and equipment necessary to ensure that the vehicle/ engine/equipment will operate in conformance with applicable regulations. If the maintenance procedures are not uniform, then the specific maintenance procedures for each different make and model shall be given. A description of the program for training of personnel for such maintenance and installation shall be included.

4) An agreement that within 45 days of the Executive Officer's request any one or more of the test vehicles or equipment will be supplied to the ARB for such testing as it may require, or (by mutual consent between the ARB and applicant) will be made available at the manufacturer's facility for such testing. Provided, that in the latter case, it is further agreed that the instrumentation and equipment specified by the ARB will be made available for testing operations. Any testing conducted at a manufacturer's facility pursuant to this subparagraph shall be scheduled as promptly as possible.

5) An agreement that up to two test engines (or test equipment/vehicles) per

engine (or equipment/vehicle) category will be made available to the ARB upon request for testing for such reasonable periods as may be required. These engines (or equipment/vehicles) shall be selected by the Executive Officer and shall be typical of production models available for sale to the public. They shall also be representative of the engines and transmissions offered by the vehicle manufacturers.

6) An agreement that the modifications made in the field will be properly identified. To meet this requirement, the model number shall be permanently marked on the carburetor or another permanently affixed engine component. A permanent label, to be affixed in the engine compartment where it may be easily read, covering the following for the specific installation, shall be furnished. The label shall set forth the following:

- i. Manufacturer's name and address
- ii. The California ARB certification number identified as "CARB E.O. No. B-XX-O".
- iii. Spark timing.
- iv. Idle speed.
- v. Idle adjustment used.
- vi. Diagrams for vacuum hose routing and electrical wiring harness.
- vii. Carburetor, vaporizer/regulator model numbers, and carburetor configuration/calibration and fuel injector codes.

7) Identification and description of the engines families for which the conversion system to be certified is designed and the emission standards applicable to those engines.

IV. OFF-ROAD CATEGORIES

Applicants requesting certification for conversion systems shall utilize the appropriate test procedure for their engine category as referenced in section V addition to one of the comparative test criteria outlined in section IV.

Emissions testing performed pursuant to these test procedures shall be conducted by a vehicle/engine/equipment exhaust emissions test laboratory.

The vehicle/engine/equipment tested shall follow the appropriate break-in period as specified in

the exhaust emissions test procedures before commencing testing. Break-in periods for each off-road category are specified in the test procedures referenced below. The baseline emissions for the test vehicle/engine/equipment without the conversion system shall be determined prior to testing, but after stabilization of the vehicle/engine/equipment. Following the addition of the conversion system to the test vehicle/engine/equipment, the test vehicle/engine/equipment shall be tested to ensure that the original certification standards are met.

For the purposes of these procedures, off-road vehicles/engines/equipment and equipment are categorized as follows:

A. Small Off-Road Engines

Small Off-Road Engines include all engines less than 25 horsepower (hp) used in off-road mobile applications, with the exceptions of off-road motorcycles, all-terrain vehicles (ATV) and engines used to propel marine vessels or watercraft. New golf carts used in areas that do not meet the federal ozone standards will continue to have a zero-emission requirement. The proposed regulations are applicable to small off-road engines produced on or after January 1, 1995.

B. Off-Road Diesel Engines and Equipment

The heavy-duty off-road diesel cycle engine and equipment category consists of off-road diesel-cycle engines that are:

- (1) greater than or equal to 50 hp and less than 100 hp manufactured on or after January 1, 1998, and certified to meet the federal emission standards and certification provisions;
- (2) greater than or equal to 100 hp and less than 175 hp manufactured on or after January 1, 1997, and certified to meet the federal emission standards and certification provisions; and
- (3) diesel cycle and alternative fueled diesel cycle engines equal to 175 hp and above for off-road engines produced on or after January 1, 1996, and certified to meet California's exhaust emission standards and test procedures. This last category includes engines used in farm and construction equipment, as well as mining, forestry, and industrial equipment.

C. Off-Highway Recreational Vehicles and Engines

The off-road recreational vehicle subcategory includes off-road motorcycles, ATVs, go-karts, golf carts, and specialty vehicles. Engines used in these vehicles consist of both 2- and 4- stroke configurations and range in power from 8 hp for golf carts to over 30 hp for the larger off-road motorcycles and specialty vehicles. The proposed regulations are applicable to new specialty vehicle engines under 25 hp produced on or after January 1, 1995 and all other new small off-road engines produced on or after January 1, 1997.

D. Gasoline Spark Ignition Marine Engines

The ARB is currently developing regulations for gasoline spark-ignition marine engines, including outboard engines and personal watercraft. Outboard engines are defined as integrated engine and drive units externally mounted to the hulls of the watercraft. Personal watercraft engines are defined as watercraft that are not outboards, inboards, or sterndrive engines. This encompasses watercraft typically thought of as personal watercraft; such engines encompass watercraft commonly known as personal watercraft (Jet Skis, Wave Runners, etc.) and jet boats (the newer class of inboard style watercraft using two-stroke jet propulsion).

Staff is currently scheduled to present its marine engine proposal to the Board in December of this year. Until the marine engine regulations are formally adopted, staff proposes to utilize the U.S. EPA's definitions, standards, and test procedures for gasoline spark-ignition marine engines as set out in 40 Code of Federal Regulations Part 91.

V. TEST PROCEDURES AND STANDARDS

A. Test Procedures

1) Test Procedures for equipment for Small Off-Road Engines

For vehicles in Category I, the exhaust emission standards and test procedures set forth in "California Exhaust Emission Standards and Test Procedures for 1995 and Later Small Off-Road Engines," adopted_____, incorporated by reference in California Code of Regulations (CCR), Title 13, Section 2404.

2) Test Procedures for Off-Road Diesel Engines and Equipment

i) For 175 horsepower and greater:

“California Exhaust Emission Standards and Test Procedures for New 1996 and Later Heavy-Duty Off-Road Diesel Cycle Engines and Equipment”, and
“California Smoke Test Procedures for New 1996 and Later Heavy-Duty Off-Road Diesel Cycle Engines and Equipment Engines” emission standards and test procedures are applicable, incorporated by reference in Title 13, Section 2424.

ii) For greater than or equal to 50 horsepower and less than 175 horsepower:

“Emission Standards and Certification Provisions”, Code of Federal Regulations, Part 40, Sections 89.112-96 and 89.113-96 and “Emission Test Equipment Provisions” and “Exhaust Emission Test Procedures”, Part 40, Section 89, Subparts D and E.

3) Test Procedures for Off-Highway Recreational Vehicles and Engines

Emission standards and test procedures set forth in “California Exhaust Emissions Standards and Test Procedures for 1995 and Later Off-Highway Recreational Vehicles and Engines”, which incorporates by reference subpart E and F, Title 40, Code of Federal Regulations.

4) Test Procedures for Gasoline Spark Ignition Marine Engines

The ARB is currently developing regulations for gasoline spark-ignition marine engines, including outboard engines and personal watercraft. Outboard engines are defined as integrated engine and drive units externally mounted to the hulls of the watercraft. Personal watercraft engines are defined as watercraft that are not outboards, inboards, or sterndrive engines. This encompasses watercraft typically thought of as personal watercraft; such engines encompass watercraft commonly known as personal watercraft (Jet Skis, Wave Runners, etc.) and jet boats (the newer class of inboard style watercraft using two-stroke jet propulsion).

Staff is currently scheduled to present its marine engine proposal to the Board in December of this year. Until the marine engine regulations are formally adopted, staff proposes to utilize the U.S. EPA’s definitions, standards, and test procedures for gasoline spark-ignition marine engines as set out in 40 Code of Federal Regulations Part 91.

5) Alternative Test Plan

Applicants requesting certification for conversion systems for use in any of the above Categories may submit an alternative test plan subject to the Executive Officer's approval.

B. Vehicle/Engine/Equipment Exhaust Emission Standards

a) For small off-road engines starting with engine model year 2000 and later:

To demonstrate compliance with the applicable emission standards, each emission test result shall be adjusted by the application of a deterioration factor. The Executive Officer shall specify the use of the certification deterioration factor provided in the original engine manufacturer's certification application for the model and model year of the test engine. The deteriorated emission test results shall be in compliance with these procedures only if they are equal to or less than the California new engine exhaust emission standards for the test engine. The applicant shall be permitted one retest if the initial emission test results fail to demonstrate compliance with these procedures. The results of the initial test and the retest will be averaged, and the averaged result must comply with the standards set for the single test in order to demonstrate compliance.

b) All other off-road categories:

The add-on or modified part manufacturer shall demonstrate compliance with these procedures by showing that the exhaust emissions from the test vehicle/engine/equipment with the add-on or modified part installed are in compliance with the California new vehicle/engine/equipment exhaust emission standards for the vehicle/engine/equipment class and model year of the test vehicle/engine/equipment.

C. Evaluation Criteria for Converted Vehicle/Engine/Equipment versus Emissions Standard

The applicable emission standards shall be at least as stringent as the emission standards applicable to the engine families for which the conversion systems to be certified are designed. A maximum of one engine per engine family for which certification is sought shall be required. Prior to the commencement of testing, test engine(s)/vehicle(s)/equipment(s) must be approved by the Executive Officer as being representative of the range of engine families for which certification is being sought.

A dual-fuel conversion system shall be emission tested using each fuel that it is capable of operating on. At the conclusion of vehicle/engine/equipment mileage accumulation (i.e., break-in), a second emission test or series of tests shall be performed.

VI. APPROVAL

A. If, after a review of the data and other information submitted by the conversion system

manufacturer, the Executive Officer determines that the conversion system conforms to these procedures, he or she will issue an Executive Order of approval for such modifications.

B. Such Executive Order may be issued upon such terms as the Executive Officer deems necessary to ensure that any modifications to use an alternative fuel conversion system will meet the requirements of these procedures.

C. Approval for a conversion system for a given model year is deemed as approved for all previous model years unless specifically limited in the Executive Order. Approval for subsequent model years (i.e., carry-over) may be given, upon request by the applicant, if the Executive Officer determines that the carry-over data will adequately represent the emissions performance of the conversion system to be certified. Carry-across (installation on vehicles/engines/equipment with similar emission control systems) will also be allowed.

D. Carry-Over and Carry-Across

1) Carry-over of emission test data from the previous model year to the following model year will be allowed, if the Executive Officer determines that the carry-over data will adequately represent the emissions performance of the conversion system to be certified. Carry-across to similar engine families will also be allowed.

2) An OEM that produces conversion hardware which upgrades an old engine to the identical configuration of a newer engine family that the manufacturer also produces may carry-across the newer engine family certification test data for the conversion hardware certification process. (For these purposes, the term “identical” means that all engine parts on the converted engine which affect emissions, such as pistons, cylinder heads, etc., must be of the same design and construction as those on newer engine family. Engine calibration, including injection timing must also be identical).

3) Applications for carry-over and carry-across must be accompanied by an engineering analysis demonstrating that the emissions and durability of the conversion system and engine family for which certification is being sought will be adequately represented by a certified conversion system/engine application.

VII. CHANGES TO CONVERSION SYSTEM AFTER APPROVAL

All changes to the conversion system made after receiving an Executive Order, including

installation changes, must be submitted to the Executive Officer. The Executive Officer may require additional testing prior to approval.

VIII. NON-CONVENTIONAL SYSTEMS

The Executive Officer may deviate from these procedures for non-conventional systems, such as diesel fuel used in conjunction with an alternative fuel, in the event that such systems cannot be tested using these procedures. Such deviations shall be limited to those necessary for the proper testing and evaluation of such systems.

IX. INSTALLATION REQUIREMENTS

Prior to releasing a converted vehicle/engine/equipment, the installer of an alternative fuel conversion system shall issue to the consumer a certificate of compliance. The certificate of compliance shall contain, but need not be limited to, the following: the vehicle's/engine's/equipment's identification number, the model year and make, the engine size, the manufacturer and fuel type of the conversion kit, the date of installation, and the emissions standard and category to which the converted system is certified. The installer shall maintain a record of this information. The ARB may require random inspection of any vehicle/engine/equipment.

X. WARRANTY REQUIREMENTS

A. Requirements of Manufacturers

The manufacturer of an alternative fuel conversion system shall warrant to the person having the vehicle/engine/equipment converted and to each subsequent purchaser of the vehicle that the alternative fuel conversion system is designed and manufactured to conform with the applicable requirements of these Procedures and is free from defects in materials and workmanship which cause the alternative fuel conversion system to fail to conform with the applicable requirements of these Procedures or cause damage to any part on the converted vehicle/engine/equipment.

This warranty shall cover customer service, and shall cover the full repair and replacement costs including the costs of diagnosis, labor, and parts (including any part on the converted vehicle/engine/equipment that is damaged due to a defect in the alternative fuel conversion system).

B. Requirements of Installers

Each installer of an alternative fuel conversion system shall warrant to the person having the

vehicle/engine/equipment converted and to each subsequent purchaser of the vehicle/engine/equipment that the alternative fuel conversion system will not fail to conform with the applicable requirements of these Procedures due to incorrect installation, and that no part on the converted vehicle/engine/equipment will be damaged due to incorrect installation. Installers of alternative fuel conversion systems shall install only those systems of a certified configuration and shall agree to indemnify the person having the vehicle/engine/equipment converted and to each subsequent purchaser of the vehicle for the cost of repair of any vehicle/engine/equipment upon which a noncertified configuration was installed. In addition, the installer shall agree to indemnify the person having the vehicle/engine/equipment converted and to each subsequent purchaser of the vehicle/engine/equipment for any tampering fines that may be imposed as a result of improper installation of the alternative fuel conversion system.

This warranty shall cover customer service, and shall cover the full repair and replacement costs including the costs of diagnosis, labor, and parts (including any part on the converted vehicle/engine/equipment that is damaged due to a defect in the alternative fuel conversion system). Before an installer installs an alternative fuel conversion system, he or she shall have submitted to the ARB a sample of the warranty statement to be provided by the installer in accordance with this paragraph.